

# Low Level Light Effects on Inflammatory Cytokine Production by Rheumatoid Arthritis Synoviocytes

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## Abstract

**Background and Objective:** Low level light therapy (LLLT) is being evaluated for treating chronic and acute pain associated with rheumatoid arthritis (RA) and other inflammatory diseases. The mechanisms underlying the effectiveness of LLLT for pain relief in RA are not clear. The objectives of this study were to determine whether LLLT decreased production of pro-inflammatory cytokines by cells from RA joints, and, if so, to identify cellular mechanisms.

**Study Design/Materials and Methods:** Synoviocytes from RA patients were treated with 810nm radiation before or after addition of tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ). mRNA for TNF- $\alpha$ , interleukin (IL)-1b, IL-6, and IL-8 was measured after 30, 60, and 180 minutes using RT-PCR. Intracellular and extracellular protein levels for 12 cytokines/chemokines were measured at 4, 8, and 24 hours using multiplexed ELISA. NF- $\kappa$ B activation was detected using Western blotting to follow degradation of I $\kappa$ B $\alpha$  and nuclear localization of the p65 subunit of NF- $\kappa$ B.

**Results:** Radiation at 810nm (5 J/cm<sup>2</sup>) given before or after TNF- $\alpha$  decreases their mRNA level of TNF- $\alpha$  and IL-1b in RA synoviocytes. This treatment using 25 J/cm<sup>2</sup> also decreases the intracellular levels of TNF- $\alpha$ , IL-1b, and IL-8 protein but did not affect the levels of seven other cytokines/chemokines. TNF- $\alpha$ -induced activation of NF- $\kappa$ B is not altered by 810 nm radiation using 25 J/cm<sup>2</sup>.

**Conclusions:** The mechanism for relieving joint pain in RA by LLLT may involve reducing the level of proinflammatory cytokines/chemokines produced by synoviocytes. This mechanism may be more general and underlie the beneficial effects of LLLT on other inflammatory conditions.